THE COMPUTING MACHINERY FIELD

Vol. 1, No. 4 October, 1952

Published about four times a year by Edmund C. Berkeley and Associates,
36 West 11 St., New York 11, N.Y.

INTRODUCTION

This is the fourth issue of a publication, now called THE COMPUTING MACHINERY FIELD, of which the first three issues were called "The Roster of Organizations in the Field of Automatic Computing Machinery". These first three issues are completely superseded by this issue, for it contains a new roster, complete and up to date, as well as other information published for the first time.

Our purpose is to help provide information in the field of computing machinery, avoiding overlapping with other publications in this field. For example, the mimeographed reports and published proceedings of the Association for Computing Machinery, with its 1200 members, cover a different area. (For information about the Association, write to us.)

We hope particularly to gather and publish information which is factual, useful, and understandable. We do not plan to be restricted to any subdivision or area of the field of machinery for handling information. We shall be glad to consider articles for publication, especially if they are short and deal with important subjects. Besides the roster, there are doubtless other kinds of systematic reporting and exchange of information which can be useful and which we can try to carry out. For example, in the next issue, scheduled for January 1953, we hope to publish a list of automatic computers, giving such information as operation speeds and memory capacity.

We shall be grateful to any one who sends us information, suggestions, comments or corrections.

THE COMPUTING MACHINERY FIELD

(formerly "Roster of Organizations in the Field of Automatic Computing Machinery")

Vol. 1, No. 4 October 1952

CONTENTS

THE COMPUTING MACHINERY FIELD is published about four times a year by Edmund C. Berkeley and Associates, 36 West 11 St., New York 11, N.Y. Subscription, $3.50 for one year, $6.50 for two years, in the United States and its Territories and in Canada; $4.50 for one year, $8.50 for two years, elsewhere. If your address changes, please notify us giving both old and new address, and allow three weeks for the change.

Material may be submitted to be considered for publication. It should be accompanied by return postage.

ROSTER OF ORGANIZATIONS IN THE FIELD OF COMPUTING MACHINERY

Fourth edition, cumulative, information as of October 3, 1952

The purpose of this Roster is to report organizations (all that are known to us) making or developing computing machinery, or components, or data-handling equipment, or automatic control equipment. Each Roster entry when it becomes complete contains: name of the organization, its address, nature of its interest in the field, kinds of activity it engages in, main products in the field, approximate number of employees, year established, and a few comments and news items. When we do not have complete information, we put down what we have.

We seek to make this Roster as useful and informative as possible, and plan to keep it up to date about every three months. We shall be most grateful for any more information, or additions or corrections that any reader is able to send us.

Although we have tried to make the Roster complete and accurate, we assume no liability for any statements expressed or implied.

Abbreviations

The key to the abbreviations follows:

Size

Ls Large size, over 500 employees
Ms Medium size, 50 to 500 employees
Ss Small size, under 50 employees
(No. in parentheses is approx. no. of employees)

When Established

Se Organization established a short time ago (1942 or later)
Me Organization established a "medium" time ago (1923 to 1941)
Le Long established organization (1922 or earlier)
(No. in parentheses is year of establishment)

Interests in Computing Machinery

Dc Digital computing machinery
Ac Analog computing machinery
Sc Servomechanisms
Ic Incidental interests in computing machinery
Cc Automatic control machinery

Activities

Ma Manufacturing activity
Sa Selling activity
Ra Research and development
Ca Consulting
Ga Government activity
Pa Problem-solving activity
Ba Buying activity
(Used also in combinations, as RMSa, "research, manufacturing and selling activity".)

*C This organization has very kindly furnished us with information expressly for the purpose of the Roster, and therefore our report is likely to be more complete and accurate than otherwise might be the case. (C for Checking)

*A This organization has placed an advertisement in this issue of THE COMPUTING MACHINERY FIELD. For more information, see their advertisement. (A for Advertisement)

Revised or added, as compared with the July, 1952, report.

ROSTER

Addressograph-Multigraph Corp., 1200 Babbitt Road, Cleveland 17, Ohio, and elsewhere *C

Addressograph plates, prepared automatically from punched tape, which will list and total repetitive figures. Data written at speeds up to 20 lines per second, and as a byproduct codes automatically punched into punch cards. Electronic facsimile printers for high-speed copying of typed data contained in unit card records. Machine functions controlled by sensing and selecting mechanism operated by punched holes in cards. Ls (8000) Le (1893) Ic RMSa

Alden Electronic and Impulse Recording Equipment Co., Alden Research Center, Westboro, Mass. *C

Recording equipment and components. Ma SEE Alden Products Co.

Alden Products Co., 117 No. Main St., Brockton, Mass. *C

General and specific components for digital and analog computing machinery; plug-in components, sensing and indicating components, magnetic delay line units, etc. Ms (300) Me (1930) Ic RMSa

Alfax Paper and Engineering Co., Alden Research Center, Westboro, Mass. *C

Electrosensitive recording papers. Ma SEE Alden Products Co.

Allen Calculators, Inc., 678 Front Ave., Grand Rapids, Mich.

Adding machines. Dc RMSa

American Totalisator Co., 745 Fifth Ave., New York, N.Y.

Automatic totaling machines for use at race-tracks. Ic MSa

Ampex Electric Corp., Redwood City, Calif.

Magnetic recording of data. Ic RMSa

ANelex Corporation, Concord, N.H., and 53 State St., Boston 9, Mass. *C

High-speed printer (600 characters per second, numerical). Other input-output devices being developed. Ss Se DIc RMSa

Applied Science Corporation of Princeton, P.O. Box 44, Princeton, N.J. *C

Radio telemetering and automatic data conversion. Devices for automatic and semi-automatic reduction and analysis of telemetering and radar data. Analog read-in and read-out devices. Digital storage and computing elements. MADAM (Multipurpose Automatic Data Analysis Machine). Ms (85) Se (1946) DAc RCPMSa

Arma Corp., 254 36th St., Brooklyn, N.Y., until Oct. 15, 1952; then Old Country Rd., Garden City, L.I., N.Y. *C

Electronic fire-control apparatus. Analog computer components including resolvers, induction generators, etc. Ls (7700) Le (1918) DASc RMSa

Armour Research Foundation, Illinois Inst. of Technology, 35 West 33 St., Chicago 16, Ill. *C

Magnetic recording. Digital, analog, and data-handling equipment. Servomechanisms. Ls (1000) Me (1936) DASc RCa

Askania Regulator Co., 240 E. Ontario St., Chicago 11, Ill. *C
Use analog computers; manufacture servomechanisms and automatic controls. Ms (250) Me (1930) SCc RMSa

Autocall Co., Shelby, Ohio
Relays for Harvard Mark II calculator. Ic MSa

Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill. *C
Telephone equipment, relays, stepping switches, etc., for independent telephone companies and computing machinery companies. Automatic control components. Ls (6000) Le (1892) ICc RMSa

Avion Instrument Corp., Paramus, N.J.
DAc Ma

Baird Associates, 33 University Road, Cambridge 38, Mass. *C
Spectroscopic analysis equipment. Scientific instruments. Analog devices and servomechanisms. Ms (150) Me (1936) AISc RMSa

Barber-Colman Co., Rockford, Ill. *C
Textile machinery, automatic controls, machine tools, etc. Barber-Colman-Stibitz digital computer, operating. Ls (3000) Le Dc RMSa

Beckman Instruments Inc., South Pasadena, Calif. *C
"Analog-digital" convertor. Special purpose control computers. EASE computer (Electronic Analog Simulating Equipment). Ls (1000) Le (1934 DAc RMSa

Bell Telephone Laboratories, Murray Hill, N.J., and 463 West St., New York, N.Y.
Automatic switching. Bell general purpose relay computers, for government use and their own use. Ls Le Dc Ra

Bendix Computer Division, Bendix Aviation Corp., 5630 Arbor Vitae, Los Angeles 45 Calif. *C
Makers of Maddida, digital differential analyzer, and new, much improved models of own design. (This division purchased from Northrop Aircraft Co.) Ms (50) Se (1952) DAc RMSa

Bendix Pacific Division, North Hollywood, Calif.
Telemetering systems. Ic RMSa

Benson-Lehner Corp., 2340 Sawtelle Blvd., West Los Angeles 64, Calif. *C
Automatic and semi-automatic devices (both analog and digital) for computing data analyzing, data reduction, optical measuring, guided missile analysis, etc. Commercial applications of industrial control devices. Ms (65) Se (1950) DAc RCMSa

Edmund C. Berkeley and Associates, 36 West 11 St., New York 11, N.Y., and 19 Milk St., Boston 9, Mass. *C
Small one-of-a-kind computers (Simon) and robots (Squee). Others under development. Ss (7) Se (1948) Dc RCMSa *A

Boeing Airplane Co., Seattle 14, Wash.
Boeing Electronic Analog Computer. Servomechanisms and analog computing devices. Ls Le ASc RMSa

Karl J. Braun Engineering Co., State St., Stamford, Conn.
Mechanical punches for garment-tag reader, etc. Ss Se Ic RMa

British Tabulating Machine Co., Ltd., 17 Park Lane, London W. 1, England *C
Punched card machines. Ls (4500) Le (1908) Dc RCPMSa

Brush Development Co., 3405 Perkins Ave., Cleveland 14, Ohio
Recording analyzers. Magnetic tape, heads, and drums. Computer components. Ls Le Ic RMSa

Bureau of Census, Washington 25, D.C. *C
Design and construction of statistical processing equipment. Special punch card machines and other machines for own use. First customer owning a Univac. Ls (1100 in Machine Tabulation Division) Le (1890 in punch card field) Dc Ga

Burlingame Associates, 103 Lafayette St., New York 13, N.Y. *C
Sales organization for Computer Corp. of America, and Eastern sales representative for Computer Research Corp.

Burroughs Adding Machine Co., 6071 Second Ave., Detroit, Mich., and 511 No. Broad St., Philadelphia, Pa. *C
Adding machines, bookkeeping machines, etc. Research division in Philadelphia has made Burroughs Laboratory Computer, an electronic digital test computer. Pulse control components. Servomechanisms. This company owns Control Instrument Corp., which SEE. Ls (18,000) Le (1896) DSc RMSPa

Clary Multiplier Corp., 408 Junipero St., San Gabriel, Calif. *C
Adding and multiplying machines, cash registers, electronic counters, automatic read-out devices for electronic computers, data-reduction apparatus, analog-to-digital converters. Ls (1500) Me (1939) DAc RMSa

Computation Centre, Univ. of Toronto, Toronto, Canada *C
Digital, electronic computers. Ferranti Electric automatic computer in operation. Ss (20) Se (1947) RPa

Computer Corp. of America, 149 Church St., New York 7, N.Y.
Electronic analog computer. Se Ac RMa

Computer Research Corp., 3348 West El Segundo Blvd., Hawthorne, Calif. *C
Digital computers, computer components. Computing systems (general and special purpose, business or scientific), digital differential analyzers, magnetic components. CADAC (CRC102) general purpose computer. Ms (130) Se (1950) Dc RCMSa

Computing Devices of Canada, Lim., 338 Queen St. (headquarters) and 475 Cambridge St. (laboratories), Ottawa, Ont., Canada *C
Ms (90) Se (1948) DASc RCPMSa *A

Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 8, Calif. *C
Automatic electronic digital computers (Model 30-201). Digital and analog data handling and conversion systems (SADIC, Millisadic, etc,). Automatic translator magnetic tape to punched card. Ls (750) Me (1937) Dc RMSa *A

Consolidated Vultee Aircraft Corporation, Los Angeles, Calif.
The Charactron, a cathode-ray tube containing a stencil of character-shaped openings, for producing characters on the screen at high speed. Ls Me Ic RMSa

Control Instrument Co., 67 35th Street, Brooklyn, N.Y. *C
Fire-control equipment. 1000-line-a-minute tabulator sold to Prudential Insurance Co. of America. Digital and analog machines and components. Now a subsidiary of Burroughs. Ls (1200) Me (1934) DAc RMSa

Davies Laboratories, Inc., 4705 Queensbury Road, Riverdale, Md.
Ac Ma

The de Florez Co., 116 East 30 St., New York, N.Y.
Magazine subscription fulfillment problem, etc. Ss Se DAc RCa

Digital Control Systems, Inc., Top of Mount Soledad, P.O. Box 779, La Jolla, Cali
Ss Se Dc RMSa

Digital Products Inc., 7852 Ivanhoe Ave., La Jolla, Calif.
Dc Ma

Eastman Kodak Co., Camera Works, 333 State St., Rochester, N.Y. *C
Use of film with small dots for computer input-output. High-speed printers: photographic, electro-mechanical, electronic facsimile. Ls Le (1888) Ic RCMSa

Eckert-Mauchly Division, Remington Rand, Inc., 3747 Ridge Ave., Philadelphia, Pa.
All-purpose electronic digital computers. Univac Factronic System, 8 sold, 4 installed as of 10/1/52. Ls (600?) Se (1946) Dc RCMSa
*A SEE also Remington-Rand, Inc.

Thomas A. Edison, Inc., Instrument Division, 22 Lakeside Ave., West Orange, N.J.
Automatic control components. Ls Le Cc RMSa

Electronic Associates, Inc., Long Branch, N.J. *C
Digital-to-analog converter (Model 417). Digital plotting system (Dataplotter). General and special purpose analog computers, and devices. Special purpose digital devices. Ms (350) Se (1945) DAc RMSa *A

Electronic Computer Corp., 160 Avenue of the Americas, New York 13, N.Y., and 265 Butler St., Brooklyn, N.Y. *C
Constructing four electronic digital computers (three Elecom-100 and one Elecom-200 computers). Delay lines, pulse transformers, magnetic recording heads, magnetic drums, D.C. plug-in amplifiers. Ms (60) Se (1949) Dc RMSa

Electronic Engineering Co., 180 South Alvorado St., Los Angeles, Calif.
Analog computing machinery. Analog-to-digital-to-analog converters. Polar-to-rectangular-to-polar converters. Servomechanisms. Ms Se DAc RMSa

Elliott Bros. (London) Ltd., Century-Works, Lewisham, London S.E. 13, England, and Research Laboratories, Elstree Way, Borehamwood, Herts., England *C
Digital, analog, and servomechanisms. Ls (2000) Le (1800) DASc RMSa

Engineering Research Associates, Inc., (Subsidiary of Remington-Rand, Inc.) 1907 West Minnehaha Ave., St. Paul, Minn., and 510 18th St. South, Arlington Va. *C
Digital computers; ERA 1101 electronic digital computer; the Logistics Computer. Magnetic storage systems, including magnetic heads, magneti drums, etc. Shaft-position indicator systems, self-recording accelero meters, analog magnetic recording systems, data-handling equipment, special purpose communications equipment, pulse transformers. Subsidiary of Remington-Rand, Inc., which SEE. Ls (750) Se (1946) Dc RMCPSa *A SEE also Remington-Rand, Inc.

Engineers Northwest, 100 Metropolitan Life Bldg., Minneapolis 1, Minn. *C
Test-scoring machines and equipment. Ss (20) Se (1945) DAc RCMa

English Electric Co., Stafford, England *C
Manufacturer of fully engineered versions of ACE (see National Physical Laboratory). Ls Le DIc RMSa

Federal Telephone and Radio Corp., Clifton, N.J.
Equipment for airline reservation problem. Ic RMSa

Felt and Trarrant Mfg. Co., Comptometer Division, 1735 North Paulina St., Chicago, Ill.
Adding machines. Ls Le Dc RMSa

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N.Y., agent for Ferranti Electric Ltd., Moston, England, and Mount Dennis, Toronto, Canada. *C
Complete electronic digital computers (Ferranti). High-speed punch tape readers. Magnetic drum memory equipment, etc. Ls (10,000) Le (1896) Dc RMSa

Foxboro Co., Foxboro, Mass.
Automatic controllers. Ls Le Cc RMSa

The Franklin Institute Laboratories for Research and Development, 20th St. & Benjamin Franklin Parkway, Philadelphia 3, Pa. *C
Fire control equipment. Special purpose analog computers, large and small scale. Digital computer components. Prototype construction. Ms (280) Se (1946) DAc RCa

Friden Calculating Machine Co., Inc., San Leandro, Calif. *C
Desk calculating machines. Ls (2000) Me (1934) Dc RMSa

Ford Instrument Co., (Division of the Sperry Corporation), 31-10 Thomson Ave., Long Island City 1, N.Y. *C
Gun fire control apparatus. Analog computers and components, magnetic amplifiers, servo motors, differential and integrator elements. Instruments for shipborne and airborne armament and navigational control. Ls (3800) Le (1915) ASc RMSa

General Controls, 801 Allen Ave., Glendale 1, Calif.
Automatic controllers (pressure, temperature, level, flow). Cc RMSa

General Electric Co., Syracuse, N.Y., and Schenectady, N.Y. *C
Digital and analog, electric and electronic, computers and analyzers. Automatic electronic digital computers, OARAC. Ls Le Ic RMSa

General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N.J.
Ac Ma

Gerber Scientific Instrument Co., 89 Spruce St., Hartford 1, Conn.
Dc Ma

Goodyear Aircraft Corp., Dept. 65A, Akron 15, Ohio
Goodyear electronic differential analyzers (Geda). Ac RMa

Haller, Raymond, and Brown, Inc., State College, Pa. *C
Electronic digital computer for solution of up to 1200 simultaneous equations, using magnetic drum and tape. Computer components, analog computers, developmental models of electronic and mechanical-electrical systems. Ms (90) Se (1946) DAc RMSa

Harvard Computation Laboratory, Cambridge 38, Mass.
Harvard Mark I, II, III, IV calculators for Navy, Air Force, and own use. Ms Se Dc RPMa

Hathaway Instrument Co., 1315 Clarkson St., Denver 10, Colo.
Ac Ma

Hogan Laboratories, 155 Perry St., New York, N.Y. *C
Facsimile machines. Digital, high-speed printers and computers. Manufacturing the Circle Computer (3 in production). Ms (60) Me (1929) Dc RMSa *A

Hughes Research and Development Laboratories, Hughes Aircraft Co., Culver City, Calif.
Automatic data handling systems. Industrial process control systems. Small powerful electronic digital computer. Fire-control equipment. Aircraft control. Navigation systems. Ls Me DAc RMSa

Industrial Control Co., Straight Path and Arlington Ave., Wyandanch, N.Y.
Dc Ma

Institut Blaise Pascal, Laboratoire de Calcul Analogique, 155, rue de Sèvres, Paris 15, France
Ac RPa

Institut Blaise Pascal, Laboratoire de Calcul Mécanique, 25, Avenue de la Division LeClerc, Chatillon-sous-Bagneux (Seine), France *C
Constructing a digital calculator. Ss (9) Me (1939) Dc RPa

Institute for Advanced Study, Princeton, N.J.
"Maniac", big fast electronic digital calculator, for own use. Dc RPMa

Intelligent Machines Research Corp., 134 So. Wayne St., Arlington, Va. *C
Devices for reading characters on paper, etc. Pattern interpretation equipment. Sensing mechanisms. Digital computer elements. Ss (6) Se (1951) Dc RCMSa *A

International Business Machines Corp., 590 Madison Ave., New York, N.Y. *C
Punch card machines. IBM Selective Sequence Electronic Calculator. IBM Defense Calculator (magnetic tape, magnetic drum, electrostatic storage). Card programmed calculators, electronic calculating punch. Data processing equipment. Process control equipment. Ls (38,000) Le (1911) Dc RMSa

International Telephone and Telegraph Corp., 67 Broad St., New York, N.Y.
Equipment for airline reservation problem. Fully automatic pneumatic tube system, by dialing. Ic RMSa

Jacobs Instrument Co., 4718 Bethesda Ave., Bethesda 14, Md. *C
Small, compact digital computers (Jaincomp A, B, B1). Analog computers. Input and output devices. Complete instrument systems. Ms (60?) Se (1948) DASc RMSa

A. Kimball Co., 307 West Broadway, New York, N.Y. *C
Machine for printing and punching garment tags. Input mechanisms. Ms (200+) Le (1876) Ic RMSPa

Laboratory for Electronics, Inc., 75 Pitts St., Boston 14, Mass. *C
Special computers to suit customer requirements. Ms (425) Se (1946)
DASc RCMPSa

Leeds and Northrup, 4901 Stanton Ave., Philadelphia, Pa.
Automatic controls. Ls Le Cc RMSa

Librascope, Inc., 1607 Flower St., Glendale 1, Calif. *C
Digital and analog computers and components. Ls (700) Me (1937)
DASc RMSa

Lithomat Corp., Cambridge, Mass.
SEE Photon, Inc.

Arthur D. Little, Inc., 30 Memorial Drive, Cambridge 42, Mass., and elsewhere. *C
Analog-digital converter called "Digital Reader". Conversion and input devices. Ls (550) Le (1886) Ic RCa

Logabax Co., 12, rue de l'Arcade, Paris, France
Collaborating with Institut Blaise Pascal on computing devices.
DIc RMSa

W.S. MacDonald Co., Inc., 33 University Rd., Cambridge, Mass. *C
Digital business machines using magnetic drum memory for 10,000 registers. Ss (20) Se (1946) Dc RMSa *A

The Magnavox Co., Components Div., Fort Wayne 4, Ind.
Ac Ma

Magnetic Metals Co., Hayes Ave. & 21st St., Camden, N.J. *C
Magnetic memory storage units for digital computers. Magnetic cores, tapes, laminations for magnetic amplifiers, servomotors, etc.
Ms (380) Se (1942) Ic RMSa *A

Marchant Calculators, Inc. (formerly Marchant Calculating Machine Co.), Oakland 8, Calif. *C
Desk calculators. Electronic digital computers. Marchant-Raytheon Binary-Octal desk calculator. Ls (2500) Le (1910) Dc RMSa

Marchant Research, Inc., Oakland 8, Calif. (formerly Physical Research Laboratory, Pasadena, Calif.) *C
Electronic digital computers (including Miniac). Magnetic storage systems, magnetic heads, data handling equipment including analog-to-digital converter. Pulse transformers, distributed delay lines, etc.
Ss Se Dc RMSa

Massachusetts Institute of Technology, Digital Computer Laboratory (formerly Servomechanisms Laboratory); also Center of Analysis; Cambridge 39, Mass.
"Whirlwind" electronic digital computer. Ms (300+) Se (1945?) DAc RCPa

Mellon Institute, Pittsburgh 13, Pa. *C
Ss (6) Se (1950) Dc RCa

Mid-Century Instrumatic Corp., 611 Broadway, New York 12, N.Y.
Components for electronic analog computers: function-generators, multipliers, etc. Ss (20) Se (1947) Ac RMSa

William Miller Corp., 325 No. Halstead Ave., Pasadena 8, Calif.
Electronic analog computers. Ac Ma

Minneapolis-Honeywell Regulator Co., Industrial Division, 4580 Wayne Ave., Philadelphia 44, Pa.
Automatic controllers. Brown Instruments. Ls Le Cc RMSa

Minnesota Electronics Corp., 47 West Water St., St. Paul 1, Minn. *C
Digital and analog computers. Magnetic components, magnetic decision elements. Data reduction systems, telemetering. Ss (35) Se (1946) DAIc RMSa *A

Monroe Calculating Machine Co., Orange, N.J. *C
Desk calculating machinery. Electronic digital computer research. Monroe
Ls (4000) Me (1925) Dc RMSa *A

Moore School of Electrical Engineering, Univ. of Pennsylvania, Philadelphia, Pa. *C
Place where Eniac, and Edvac electronic digital computers were constructed. Constructing MSAC (Moore School Automatic Computer).
Ms (80) Me (1923) DAc RCPMa

National Bureau of Standards, Division of the National Applied Mathematics Laboratories: *C
(1) Computation Laboratory, Washington 25, D.C.
Bureau of Standards Eastern Automatic Computer. Ms (100) Me (1938) Dc RCPGa

(2) Institute for Numerical Analysis, 405 Hilgard Ave., Los Angeles 24, Calif.
Bureau of Standards Western Automatic Computer. Ms (100) Se (1947) Dc RCPGa

(3) Machine Development Laboratory, Washington 25, D.C.
Specifications development. Systems analysis. Ss (10) Se (1947) Dc RCGa

National Bureau of Standards, Electronics Division, Electronic Computers Section, Washington 25, D.C. *C
Ms (80) Se (1946) Dc RCMGa

National Cash Register Co., Main and K Sts., Dayton, Ohio *C
Cash registers. Accounting-bookkeeping machines. Adding machines.
Ls (19,000) Le (1884) Ic RMSa

National Physical Laboratory, Electronics Section, Teddington, Middlesex, England *C
Designer and builder of the first model of ACE (Automatic Computing Engine -- high-speed, electronic, digital). Ls Le DIc RCPMa

Naval Research Laboratory, Anacostia, Md.
Ms Me Ic RCPa

Northrop Aircraft Co., Hawthorne, Calif.
Computer division sold to Bendix Aviation Corporation, which SEE.

Nuclear Development Associates, 80 Grand St., White Plains, N.Y.
Ss Se DIc RMSa *A

Olivetti Corp. of America, 580 Fifth Ave., New York 36, N.Y.
Desk adding, calculating, and printing machines. Dc RMSa

Pacific Electronics, Saticoy, Calif.
Dc Ma

Panellit, Inc., 6312 North Broadway, Chicago 40, Ill.
For automatic control: coordinated and graphic control panels for process variables; multiple point scanning systems; annunciator systems. Cc RMSa

Pennsylvania State College, State College, Pa. *C
X-RAC computer for crystal electron density functions. S-FAC for structure factor calculations. Ss (20) Se (1947) Ac RPa

George A. Philbrick Researches, Inc., 230 Congress St., Boston 10, Mass. *C
Electronic analog computing equipment. Ss (5+) Se (1946) Ac RCMSa *A

Photon, Inc., 58 Charles St., Cambridge 41, Mass. (formerly Lithomat Corp.) *C
Machinery for composing type by photography. Ms (100) Me (1940) DIc RCMSa

Physical Research Laboratory, Pasadena, Calif.
SEE Marchant Research, Inc.

Pitney-Bowes, Inc., Stamford, Conn. *C
Postage meters. Tax-stamping meters. "Tickometer" counting and/or imprinting machines. Ls (3000) Le (1920) Ic MSa

Potter Instrument Co., 115 Cutter Mill Rd., Great Neck, N.Y. *C
Electronic counters. Electronic tag reader. Random access memory. High speed printer ("flying typewriter"). Ms (100) Se (1942) Dc RCMSa

Powers-Samas Accounting Machines Sales, Ltd., 814 No. Michigan Ave., Chicago 11, Ill. Agent for Powers-Samas Accounting Machines, Ltd., England *C
Punched card tabulating equipment using small, medium, and standard cards. Ls (6000) Le (1916) DIc RMSa

Productions Electroniques, 8, rue Laugier, Paris 17, France
Collaborating with Institut Blaise Pascal on magnetic recording devices. Ic RMSa

Radio Corp. of America, Laboratories, Princeton, N.J.; RCA Victor Div., Camden, N.J., and Harrison, N.J. *C
Selective electrostatic storage tube (formerly Selectron), Radechon, Graphecon, Williams Tube, Time Interval Counter, Computer systems. Magnetic matrix memory. Ls Le Ic RMSa

The Rand Corporation, 155 Fourth St., Santa Monica, Calif. *C
Constructing an electronic digital computer of the type of the Institute for Advanced Study. Studies of robots, individually and in societies. Ms (300?) Se (1946) DASIc RCPa

Raytheon Manufacturing Co., Waltham, Mass. *C
Radar. Fire-control equipment. Big fast electronic digital computers (Raydac). One finished and being shipped. Ls (18,000) Me (1928) DAc RMSa

Reeves Instrument Co., 215 East 91 St., New York, N.Y.
Fire-control equipment. "REAC" electronic analog computers. Ls Me Ac RMSa

Remington Rand, Inc., 315 4th Ave., New York 10, N.Y., and elsewhere. *C
Punched card machines, office machines, electronic digital computing machines (Univac Factronic System), servomechanisms. Ls (30,000 of which 1800 on computers) Le DASc RCMSa SEE also Eckert-Mauchly Division, and Engineering Research Associates (Subsidiary) *A

Rutherford Electronic Corp., 3707 So. Robertson Blvd., Culver City, Calif.
DAc Ma

Saunders Automatic Systems Corp., Memphis, Tenn.
"Keedoozle" automatic store devices. Ic RMSa HAS BEEN LIQUIDATED

Scientific Computing Service, Ltd., 23 Bedford Sq., London, W.C. 1, England *C
Ss (16) Me (1938) DAIc CPa

Servo Corporation of America, New Hyde Park, N.Y.
Servomechanisms. Automatic controls. SCc RMSa

Servomechanisms, Inc., Post and Stewart Aves., Westbury, N.Y.
Automatic control systems, and components. ASc RMSa

Sociéte Automatisme d'Electronique, Courbevoie, Paris, France
Digital computing devices. Ms (300) DAc RMSa

Sperry Gyroscope Co., Great Neck, N.Y. *C
Fire-control equipment. Navigation equipment, sea and air. Radar, Loran, gyrocompasses. Ls (16,000) Le (1910) Ac RMSa

Swedish Board for Computing Machines, Drottninggatan 95A, Stockholm, Sweden *C
Planned the relay computer BARK (Binary Automatic Relay "K"omputer), which was then built by the Royal Telegraph Administration. BARK has run commercially since July 1950. Planning and constructing an electronic computer of the Princeton type. Ss (30) Se (1949) Dc RMCPa

Sylvania Electric Co., 70 Forsyth St., Boston 15, Mass. *C
Big fast electronic analog and digital computers, for government. Sub-assemblies of diodes and triodes. Ls (1200) Se (Company, 1901; this division, 1945) DAc RMSa

Taller and Cooper, 75 Front St., Brooklyn, N.Y. *C
Data recording and conversion systems, printers, perforators. Toll equipment for bridges. Ms (250) Me (1926) DIc RMSa

Taylor Instrument Co., Rochester, N.Y.
Automatic controllers. Ls Le Cc RMSa

Technitrol Engineering Co., 2751 No. 4 St., Philadelphia 33, Pa. *C
Computing and control equipment. Complete digital systems. Components, pulse transformers. Electrical and acoustic delay lines. Ms (65) Se (1947) DAc RMSa

Telecomputing Corp., 133 E. Santa Anita Ave., Burbank, Calif. *C
Data reduction instruments (Teleducer, Teleplotter). Ms (160) Se (1947) Dc RMPa

Teleregister Corp., 157 Chambers St., New York 7, N.Y. *C
Digital and analog special purpose computers. Data inventory systems for specific applications -- travel reservations, flight data processing, stock market quotations, etc. Magnetronic reservisor, in use at American Airlines' reservation center. Associated with Western Union. Ms (275) Me (1928) DAc RMSa

John E. Thompson and Associates, 7210 So. Yates Ave., Chicago 49, Ill.
Ac Ma

Transmitter Equipment Manufacturing Co., Inc., 345 Hudson St., New York 14, N.Y.
DAc Ma

Ultrasonic Corp., 61 Rogers St., Cambridge, Mass.
Automatic feedback control development and equipment. Cc RMSa

Underwood Corp., General Research Lab., 56 Arbor St., Hartford 6, Conn. *C
Underwood electric typewriters, used in Harvard Mark II calculator. Ls (company 10,000; laboratory, 100) Le (1895) DIc RMSa

Union Switch and Signal Co., Division of Westinghouse Airbrake, Pittsburgh 18, and Swissvale, Pa.
Railroad signaling and control systems. Ls (4000) Le Ic RMSa

U.S. Air Force, Cambridge Research Center, 230 Albany St., Cambridge 39, Mass.
Has the ABC (Automatic Binary Computer) and a CADAC (Computer Research Corp. 102). Ms Me DIc Ga

U.S. Air Force, Office of Air Research, also Inst. of Technology, Wright-Patterson Air Force Base, Dayton, Ohio
Electronic strategy machine, made by L.I. Davis. Assembling a computing laboratory. Ls Se Ic Ga

U.S. Army, Ballistic Research Laboratories, Aberdeen Proving Ground, Aberdeen, Md. *C
Has Bell, Edvac, Eniac, Ordvac computers and others. Developing supplementary and modernizing components. Ms Le DAc Ga

U.S. Naval Proving Ground, Computation and Ballistics Division, Dahlgren, Va. *C
Has Harvard Mark II relay and Mark III electronic digital computers. Ms (200) Se (1942) Dc Ga

Univ. Mathematical Laboratory, Free School Lane, Cambridge, England
Has EDSAC electronic digital calculator. Dc RCPa

Univ. of California, Berkeley, Calif. *C
Constructing CALDIC, California Digital Computer. Dc RPa

Univ. of Illinois, Urbana, Ill.
Has finished electronic digital computer Ordvac like Institute for Advanced Study's Maniac, and delivered it to U.S. Army Ballistic Research Laboratories. Dc RPa

Univ. of Manchester, Mathematical Laboratory, Manchester, England *C
Has automatic electronic digital computer built by Ferranti Electric, Ltd. This laboratory developed much of the design. Ss (8) Se (1947) Dc RPa

Univ. of Michigan, Willow Run Research Center, Willow Run Airport, Ypsilanti, Mich. *C
High-speed digital computers, including MIDAC. Electronic and electro-mechanical analog computers. Special purpose computing equipment. Ls (500) Se (1946) DAc RCPa

Victor Adding Machine Co., 3900 No. Rockwell St., Chicago, Ill.
Adding machines. Dc RMSa

Wallind-Pierce Corp., 109 Bond St., Redondo Beach, Calif. *C
Digital-to-analog, and analog-to-digital translators. Digital and analog computers, magnetic amplifiers, etc. Ss (18) Se (1951) DASc RCMSa

Wang Laboratories, 296 Columbus Ave., Boston 16, Mass.
Magnetic delay-line memory units. Static magnetic memory systems and other devices. Ss Se (1951) Dc RCMSa

Watson Scientific Computing Laboratory, 612 West 116 St., New York, N.Y.
The pure science department of International Business Machines. Simultaneous linear equation solver. Astronomical plate measuring machine. Ss Me DAc RCPa

Wayne University, 5135 Cass Avenue., Detroit 1, Mich. *C
Computation laboratory. Now has the first MIT differential analyzer. Acquiring a large digital computer. Ss (10) Se (1950) DAc RCPa

Western Union Telegraph Co., 60 Hudson St., New York 13, N.Y. *C
Punched tape input and output equipment for Harvard Mark II calculator. Ls (company, 43,000) Le (1851) Ic Ra (computing devices)

Westinghouse Electric Corp., Industry Engineering Dept., East Pittsburgh, Pa.
Analog computers for: mechanical and electrical problems; regulating systems; servomechanism behavior; flow of heat, oil, or gas; other purposes. DC and AC calculating boards. ANACOM computer. Ls Le DASc RCMSa

Zator Co., 79 Milk St., Boston 9, Mass. *C
Equipment and systems, for coding, filing, and finding information (Zatocoding systems). High-speed selectors for notched cards. Methods for use of digital computing machines to recover information. Ss Se (1947) Ic RCSa *A

COMMUNICATION AND CONTROL IN THE COMPUTING MACHINERY FIELD

Many of us who are interested in computing machinery and have been working in the field for some time have become convinced of the great advances implied by machines for handling information automatically, and by their science, cybernetics (Norbert Wiener's definition: "control and communication in the animal and the machine"). This development of the middle twentieth century is steadily becoming more important, and has in fact the earmarks of a revolution as great as the Industrial Revolution.

Whatever part of the field we happen to be working in -- research, design, construction, applications, or just the pure science -- we are all of us in process of becoming experts in the handling of information: "information engineers".

One of the major problems that we face, as the number of information engineers mounts into thousands, is that of organizing really well the flow of information between ourselves. We need good ways of communication among ourselves. We need control over our ways of communication so that each of us can find out easily what he wants to know. Of all people, information engineers are surely the last to be justified in using poor ways of communication among themselves.

Fortunately, the harmful effects of military security upon the free flow of information touches our field only in a minor way. We are largely free to communicate in full accord with the fine purpose put down in the constitution of the Association for Computing Machinery: "to advance the science, design, development, construction, and application of modern machinery for performing operations in mathematics, logic, statistics, and kindred fields, and to promote the free interchange of information about such machinery in the best scientific tradition".

Fortunately, the meetings of the Association for Computing Machinery over the years since 1947 when it was formed have not yet reached the point where most of the papers are incomprehensible to most of the audience -- and there are people on the Council of the Association who are determined not to let that happen. The language for communication in our field is still working in most respects rather well. (Incidentally, if any reader of THE COMPUTING MACHINERY FIELD has any comments on nomenclature, he might send them to Mr. Nathaniel Rochester, Engineering Lab., International Business Machines Corp., Poughkeepsie, N.Y., who is chairman of an Institute of Radio Engineers' committee now working on an improved nomenclature in the field of computing machinery.)

But there are serious problems of communication among ourselves, even with a fair degree of freedom to discuss and a fairly comprehensible language (for the most part) to discuss in. Some of them are:

1. A Problem of Discussion: How to find and talk with people nearby who are interested in discussing the same subdivision of the field you are interested in.
2. A Problem of Learning: How to read, understand, and remember the mass of information being produced by many different organizations.
3. A Problem of a Program Committee: How to arrange that the giver of a paper says something worthwhile and says it so that other people can understand what he says and enjoy listening to him.

4. A Problem of Personnel: How to find out and attract good people into your organization.

Take Problem 3 for example. Suppose the program committee says that it is not their responsibility to bring up the subject of how the speaker will talk to the audience. Or suppose the speaker takes the position that it is up to the audience to discover what he means even if he is using many words and symbols that only he has ever seen before. Or suppose the audience has the feeling that it is impolite to express its feelings to the speaker. Under such conditions the achievement of communication is being blocked. More feedback from the audience is needed to correct the errors in communication.

The design of working communication systems that solve such problems as these has many points of resemblance to the design of computing systems that solve the problems of communication between their different parts. Both need to be the concern of information engineers.

BOOKS AND OTHER PUBLICATIONS

This is a list of books, articles, periodicals, and other publications which have a significant relation to the computing machinery field and which have come to our attention. The main purpose of this list is to report the existence of information, because finding out that something exists is nearly always the hardest thing to find out. We hope this list may make it easier to keep up to date in the field of computing machinery.

We shall be glad to report other information in future lists, if a review copy is sent or loaned to THE COMPUTING MACHINERY FIELD.

The general plan of each entry is: author or editor / title / publisher or issuer / date / publication process, number of pages, price or its equivalent, a few comments. It is not planned to repeat entries in later issues of THE COMPUTING MACHINERY FIELD except where corrections or changes are involved.

1. Adams, C.W. / Applications and Procedures for the Whirlwind I Computer, Report R - 201 / Digital Computer Laboratory, Mass. Inst. of Technology, Cambridge 39, Mass. / Nov. 1, 1951, photooffset, 16 pp., perhaps free
   Deals with "Objectives and Activities of the Applications group", "Techniques for Operating the Whirlwind I Computer", "Standard Automatic Subroutines", and "Multiple Register Programming".

2. Consolidated Engineering Corp., staff of / Electronic Digital Computer, Model 30-201 / Consolidated Engineering Corp., 300 No. Sierra Madre Villa, Pasadena 15, Calif. / Aug. 1952, photooffset, 31 pp., free
   Describes this automatic computer and its list of commands, gives diagrams, etc.

3. Ferranti Ltd., staff of / Manchester Universal Electronic Computer: General Specification (List DC-5), and Details of Instruction (List DC-6) / Ferranti Ltd., Moston, Manchester, 10, England / Sept. 1952, mimeog., 6 pp and 8 pp respectively, free

   DC-5: "This specification provides an outline of the operating features of the computer", and information on dimensions, and tape-editing facilities.
   DC-6: "This pamphlet details the list of instructions which are available."

4. Flesch, Rudolf / The Art of Clear Thinking / Harper and Bros., 49 East 33 St., New York, N.Y. / 1951, printed, 212 pp., $2.75
   Particularly the first five chapters on robots, apes, nerves, thoughts, etc., and also the remaining chapters but to a smaller extent, bear on computing machinery and cybernetics.

5. International Business Machines Corp., Applied Science Department, editor, and others / Proceedings of the Industrial Computation Seminar, September, 1950 / International Business Machines Corp., 590 Madison Ave., New York, N.Y. / 1951, printed, 103 pp., perhaps free
   Contains 18 papers on mathematical and computational subjects by 28 authors, and reports of discussion from other seminar participants. (There have been previous published seminars also.)

6. Jacobs Instrument Co., staff of The / JEBB Circuits (i.e.,Jacobs Electronic Building Block Circuits) / The Jacobs Instrument Co., 4718 Bethesda Ave., Bethesda 14, Md. / undated (1952?), dittoed, 31 pp., probably free

Description of a dozen pluggable electronic components for automatic digital computers, with specifications and circuits showing their operation, and prices.

7. Lehmer, D.H., editorial chairman, and others / Mathematical Tables and other Aids to Computation / National Research Council, 2101 Constitution Ave., Washington, D.C. / quarterly, printed, about 80 pages an issue, $5 a year

Each issue contains important and valuable information about automatic computing machinery and mathematical methods for computation. Often uses a condensed, technical style.

8. Microcard Foundation, staff of The / The Microcard Bulletin / The Microcard Foundation, Middletown, Conn. / issued about 6 times a year, printed, 8 to 32 pp., nominal cost

Gives publications, news, etc., about microcards. A microcard is an ordinary card 3 inches by 5 inches on which about 60 normal book pages are photographed (with 98% reduction) in full; and pages may be read in a special reading instrument.

9. Office of Naval Research, staff of / Digital Computer Newsletter / Office of Naval Research, Code 434, Navy Dept., Washington 25, D.C. / quarterly, about 8 pages, photooffset, free to persons who can demonstrate their need for the publication

News on automatic digital computers, and organizations building them.

10. Office of Naval Research, Navy Mathematical Computing Advisory Panel, editor, and others / A Symposium on Commercially Available General-Purpose Electronic Digital Computers of Moderate Price / Office of Naval Research, Navy Department, Washington 25, D.C. / May 1952, photooffset, 41 pp, perhaps free

Contains six papers and one abstract on computers of Jacobs Instrument Co., Monroe Calculating Machine Co., Computer Research Corp., Hogan Labs., Electronic Computer Corp., Consolidated Engineering Corp., and Physical Research Laboratories (now Marchant Research, Inc.)

11. Prinz, D.G. / Introduction to Programming on the Manchester Electronic Digital Computer made by Ferranti Ltd. / Ferranti Ltd., Moston, Manchester 10, England / undated (1952?), mimeog., 56 pp., perhaps free

This introduction is a condensation of the "Programmers' Handbook for Manchester Electronic Computer Mark II". The main purpose of this introduction is to give some acquaintance with the capabilities of the Ferranti computer, and to permit estimating "whether the solution of any particular problem by the machine may be worth serious examination".

12. Scientific American, staff of and contributors to / Automatic Control (the issue of September 1952) / Scientific American, 2 West 45 St., New York 36, N.Y. / 1952, printed, 196 pp., 50 cents

Contains eight well-written articles, some of them particularly interesting and informative, including "An Automatic Chemical Plant" by Eugene Ayres, "An Automatic Machine Tool" by William Pease, and "Information" by Gilbert W. King.

13. Ulman, J.N., Jr. / List of Laboratory Reports of Current Interest, Report R-173-2 / Digital Computer Laboratory, Mass. Inst. of Technology, 211 Mass. Ave., Cambridge 39, Mass. / Sept. 25, 1951, photooffset, 25 pp., perhaps free

List of several hundred reports, some of general interest, most of special interest only to members of the laboratory. "Reports issued by the Laboratory are routinely distributed only to a restricted group. Other authorized personnel .... may obtain copies of individual reports by making specific requests to John C. Proctor", at the Laboratory.

14. Van Foerster, Heinz, editor, and others / Cybernetics -- Transactions of the 8th Conference, March 15-16, 1951, New York, N.Y. / Josiah Macy, Jr., Foundation, 565 Park Ave., New York 21, N.Y. / 1952, printed, 240 pp., $4

Contains six papers on communication, etc., by Alex Bavelas, Ivor A. Richards, L.S. Kubie, H.G. Birch, Claude A. Shannon, D.M. McKay, and discussion by 16 other participants in the conference. (There have been previously published transactions.)

15. Woodward, Viola / Coding of Problems for the Ordvac - Lecture Notes / Ballistic Institute, Ballistics Research Laboratory, Aberdeen, Md. / August 1952, dittoed, 72 pages, free only to authorized persons

Binary arithmetic; scaling; the Ordvac; its physical description; Ordvac orders, programming, and coding; Ordvac problem résumés.

THE PARAMETERS OF BUSINESS PROBLEMS

At the meeting of the Association for Computing Machinery at Toronto, Sept. 8 and 9, one man remarked to me, "There are no papers at this meeting about problems that are of interest to business. The papers are all scientific, or mathematical, or engineering. It is a pity. Business men will be less likely to come to future meetings." I agreed with him that there ought to be such papers at these meetings, but pointed out that almost nobody in business writes such papers and sends them in to the program committee. How were we to get people in business to write them?

The upshot of our discussion was that there would be valuable papers from business (and not too hard to write) if business problems could be described giving their chief measurements, their parameters. Here is the important meeting-ground between business and engineers, and scientists in the field of computing machinery.

For example, here are a few plausible parameters for the problem of a life insurance company in mailing out notices to policyholders of premiums falling due.

> The company has 4 million policies in force. Each year about 10 million notices of premium due have to be prepared. The average premium notice requires 60 characters. Over the year about 35% of policies have changes of address. In the record of policies from which premium notices are prepared, about 200 characters of information have to be stored for each policy, and for some policies up to 400 characters of information. Premium notices have to be prepared about 6 weeks before premiums fall due. Affidavits have to be given to certain states that premium notices have been mailed to policyholders who took out their insurance in those states; usually a microfilm record of a photographic record on microfilm of those premium notices is made. Etc.

The use of machinery for handling information in business is probably more than 50 times the use of such machinery in science and engineering. Half a dozen kinds of businesses need large numbers of people just for handling information: life insurance, mail order, railroads, public utilities, fire insurance, department stores, airlines, etc. If a problem like stock control or billing is to be mechanized by automatic computing machinery, it must be understood rather thoroughly and its measurements must be known. It is not too difficult for a methods man in the business to understand it rather thoroughly from close contact with it, but it is almost impossible for an engineer to imagine the problem without being told about it by the methods man.

Wanted: many good engineering descriptions of many important business problems in the handling of information.

Edmund C. Berkeley

ADVERTISING

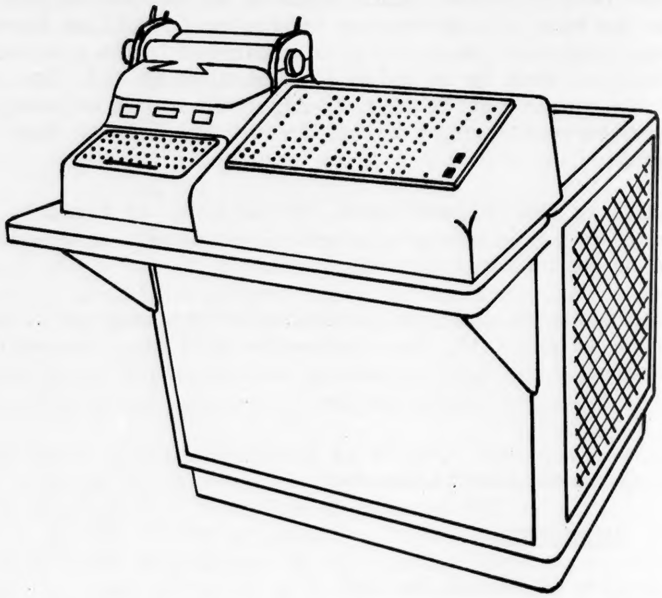
The purpose of THE COMPUTING MACHINERY FIELD is to be factual and to the point. For this purpose the kind of advertising we desire to publish is the kind that answers questions, such as: What are your products? What are your services? And for each product: What is it called? What does it do? How well does it work? What are its main specifications? Adjectives that express opinion are not desired. We reserve the right not to accept advertising that does not meet our standards.

Every advertisement in the present issue, we believe, is factual. In several cases original copy has been changed by mutual agreement between the advertiser and us, so as to be factual and objective.

For these reasons, we think that the following advertising is likely to be worth reading. So far as we can tell, the statements made are reasonable, informative, and worth considering.

Following is the index to advertisements:

M A G N E F I L E



ELECTRONIC INVENTORY REGISTER

for the

BUSINESS MAN .

Features:

KEYBOARD ENTRY
PRINTER OUTPUT
MAGNETIC DRUM STORAGE OF
INVENTORY INFORMATION
MULTIPLE CATEGORY ENTRY
AUTOMATIC LISTING OF STORED INFORMATION
SMALL SIZE

☆ ☆

THE W. S. MACDONALD CO., INC.

33 University Road

Cambridge 38, Massachusetts

The Circle Computer

- General Purpose Digital Computer
- Single Address Code
- Serial Operation
- Magnetic Drum Memory
- Replaceable Unit Chasses
- Two Typewriters for Flexibility of Input and Output
- Conservative Circuits for Reliability and Ease of Maintenance
- Designed for Convenient Operation

DESIGNED BY

NUCLEAR DEVELOPMENT ASSOCIATES INC.
80 GRAND STREET
WHITE PLAINS, N.Y.

BUILT BY

HOGAN LABORATORIES INC.
155 PERRY STREET
NEW YORK, N.Y.

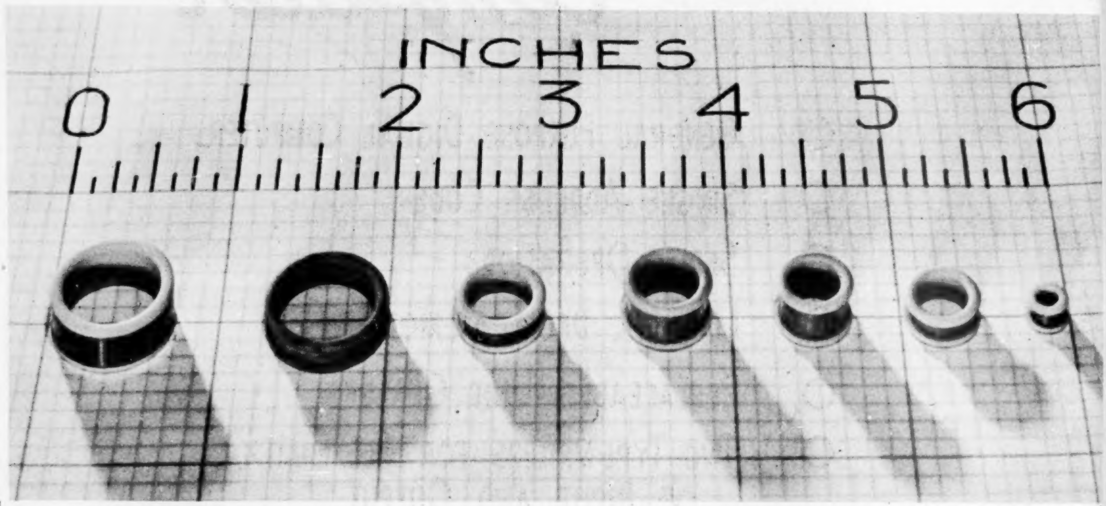
BOTH WILL BE GLAD TO FURNISH FURTHER INFORMATION

MAGNETIC METALS COMPANY

SPECIALIZING... in fabricated magnetic alloy parts of unusual properties suited to the requirements of

- *electronic computors*
- *servo-mechanisms*
- *magnetic amplifiers*
- *precision synchronous motors*
- *toroidal cores*
- *pulse transformer cores*

and many types of precision high-reactance transformers.



▲MICROCORE STORAGE ELEMENTS AVAILABLE FOR MAGNETIC SHIFT REGISTERS AND FOR COINCIDENT CURRENT MAGNETIC MEMORY ASSEMBLIES.

▶ Bulletins are available covering MICROCORES made from ultra thin alloy tape (down to .000125"), CENTRICORES (wrapped cores from alloys .001" and heavier) and special types of stamped LAMINATIONS (.002" and heavier).

Special Microcore units utilizing high harmonic content magnetization characteristics are used as modulating devices to supply high frequency carrier currents for multichannel coaxial installations and other similar applications. Supplied to accurately defined, magnetic performance characteristics, they provide stable operation for indefinitely long life as compared to vacuum tubes.

MAGNETIC METALS COMPANY

Soft Iron and Alloy Cores and Shields

21ST & HAYES AVENUE • WOodland 4-7842 • CAMDEN 1, N.J.

Information Retrieval

MACHINE INFORMATION RETRIEVAL is the application of machines to collections of records to selectively recover records that have a specified information content. It includes the associated processes of cataloguing, coding, indexing, collecting, and storage.

●

FOR EXAMPLE, a machine information retrieval system may consist of a file of articles from technical journals, a high-speed card sorting machine, and a set of cards subject-indexing and cross-referencing these articles. The most useful retrieval systems have the indexing slanted to the particular needs of the user. Card systems designed by Zator for specialized collections of information are now retrieving data from field engineering reports, articles in the bacteriological literature, research reports on jet turbines, and pediatric records.

●

LARGE-SCALE DIGITAL MACHINES may also need information retrieval techniques for the speedy recovery of information stored in their memory organs. The box number or address in the electronic memory does not usually give any clue to the information content within the box. A computing machine can be programmed to find information by making an exhaustive search of the contents of its memory, using a read-out and a decision order for each box, but this technique is very slow. It is possible, however, to produce the addresses of all the boxes containing the wanted information much more quickly through the use of a specialized retrieval step. Applications of retrieval techniques lie in logistics cataloguing and parts number discovery, medical records statistics, insurance policy statistics, or weather map selection for analogue forecasting.

●

ZATOR COMPANY was organized in 1947 to apply new machines and systems to the age-old problems of information retrieval. Zator developments to date are: *(1)* a high-speed card sorter called the *Zator Selector,** able to sort 48,000 edge-notched cards per hour; *(2)* an efficient digital scheme for retrieval coding and scanning called *Zatocoding,** making use of random superimposed digital codes; and *(3)* a new technique of language or semantics that uses *descriptors* for dealing with the slippery problem of classifying ideas and things. These three contributions are marketed together as a package called *Zatocoding Service* to commercial organizations or government agencies whose retrieval needs can be met by a card system. For the designers and users of large-scale machines, the accumulated experience of Zator Company in the retrieval field is available on a consulting basis.

●

CARD RETRIEVAL SYSTEMS. *Zatocoding Service* supplies the complete physical equipment for setting up a card-sorting information retrieval system. The Service includes a Zator Selector, Zatocoding, and the essential professional assistance required for organizing a complex information collection and applying the new retrieval methods. Zatocoding card systems are used for collections containing 2000 to 100,000 pieces of information. Where the value of the information, the need for versatile cross-indexing and the utility of rapid retrieval are great, Zatocoding has been adopted when other indexing methods have failed. Professional installation charges are $500, and the monthly service payment for rental and license is $45. Cards are $10 per thousand. The *Zatocoding* method is separately licensed for applications with other electronic or mechanical machines.

●

CONSULTATION. Zator Company has been almost alone in pioneering the application of new digital methods in machine retrieval. Modern computing machines should employ the best available methods for each type of problem, including large-scale records retrieval problems. Archaic schemes borrowed from the librarians, such as *classification* (Aristotle, 350 B.C.), *decimal numbers* (Melvil Dewey, 1876), or *indexing,* often fail to make use of the full capabilities of modern machines. Zator Company, whose founder and owner, Calvin N. Mooers, has been in the electronic digital computer field since 1945, has had wide experience in the successful application of retrieval techniques and machines to many different kinds of information. Inquiries about consultation are solicited.

ZATOR COMPANY

Dept. R-1, 79 Milk Street, Boston, Mass.

**Patents pending*

PUBLICATIONS

Edmund C. Berkeley
& Associates
19 Milk St., Boston 9, Mass.

BRIEF - FILLED WITH INFORMATION - CLEAR - SCIENTIFIC - RETURNABLE WITHIN WEEK FOR FULL REFUND

You can see them for almost nothing -- Why not take a look at them? (Here are descriptions of five -- there are 14 more in other subjects.)

P 6: CONSTRUCTING ELECTRIC BRAINS. Reprint of the series of thirteen articles by E.C. Berkeley and Robert A. Jensen published in "Radio Electronics", Oct. 1950 to Oct. 1951. Explains simply how an automatic computer is constructed; how to make it add, subtract, multiply, divide, and solve problems automatically, using relays or electronic tubes or other devices. Contains many examples of circuits. $2.20

P 1: CONSTRUCTION PLANS FOR SIMON, the Small Mechanical Brain. Complete plans, circuits, essential wiring diagrams, parts list, etc. Also recent changes, enabling Simon to handle numbers up to 255, and to perform nine mathematical and logical operations. Simon has been described in "Scientific American", Nov. 1950, and in "Radio Electronics", Oct. 1950, March and April, 1951. Second edition, 1952. ..... $5.50

P 3: CONSTRUCTION PLANS FOR SQUEE, the Robot Squirrel. Circuits, wiring diagrams, parts list, etc. Complete plans for constructing Squee, the Robot Squirrel, described in "Radio Electronics", Dec. 1951 and Feb. 1952, and in "Popular Science", July, 1952. Squee rolls over the floor, picks up "nuts" in his "hands", takes them to his "nest", there leaves them, and then goes hunting for more nuts. Second edition, 1952. ..... $4.00

P 10: THE CONSTRUCTION OF LIVING ROBOTS. Pamphlet. Discusses the properties of robots and of living beings. Outlines how to construct robots made out of hardware which will have the essential properties of living beings. Gives circuit diagrams. $1.00

P 2: THE COMPUTING MACHINERY FIELD. Quarterly. Contains up-to-date roster of over 140 organizations making or developing computing machinery; list of recent publications; articles, etc. Annual subscription. $3.50

COURSES OR GUIDED STUDY

le offer 24 courses by mail, 5 in computing machinery, 19 in other subjects (mathematics, ymbolic logic, etc.) Beginning or advanced -- For individuals or study groups. Individual cost, $22 to $35; in a study-group the cost is 50% for the second member and 25% for ach additional member. Scholarships (60%). We have enrollments in 38 states, 10 countries. our inquiry will be welcome.

---

dmund C. Berkeley and Associates, 19 Milk St., Boston 9, Mass. 152(4

lease send me ☐ publications circled, and ☐ your full announcement of publications and ourses.

P 1 P 2 P 3 P 6 P 10

eturnable in seven days for full refund if not satisfactory. I enclose $_______ in full ayment. (Add 10¢ per item to cover cost of handling and mailing.)

ame and Address ____

EAI's Dataplotter...

<u>An Electronic System That Converts</u>

<u>Digital Data To An Analog Plot</u>...

Here is a system that will save a great many man-hours and costs, and will insure accurate and clear presentation of data.

This new Dataplotter, designed and developed by Electronic Associates, Inc., will automatically plot a cartesian curve composed of incremental points or symbols from IBM card data at maximum machine reading speed.

It will accept data from other inputs — magnetic tape, keyboards, digital computers, etc.

It will retain at all times the basic accuracy of the digital system.

Here's what the Dataplotter system consists of:

Variplotter Model 205G
Digital-to-analog converter, Model 417
Data input keyboard

For further information, contact Electronic Associates, Inc., Long Branch, New Jersey. Telephone, Long Branch 6-1100. No obligation of course.

Consolidated Engineering's data-handling program is divided into three basic phases: the first features high data accuracy and medium speed; in the second, speed is paramount; the third answers the need for high speed in reducing the data gathered by automatic data-handling systems and in performing general mathematical and engineering computation.

SADIC Systems

Designed primarily for applications such as wind tunnels and engine test stands, where tests are repeated many times and much data must be reduced, SADIC Systems convert the analog signals from strain gages, thermocouples, and similar transducers to decimal digital form. Great accuracy (0.1%) and high sensitivity (it accurately indicates a 1 microvolt signal change) combined with a one-per-second sampling rate, adapt it to many test applications. Output is in dual form: an easily read visual display and discrete contact closures, which can be read out in punched cards, typewriters, punched tapes, etc. Systems of any number of channels can be assembled and added to at any time.

MILLISADIC Systems

Featuring very high speed and medium precision, the MILLISADIC Systems sample data at rates up to 1000 per second at 0.2% to 0.3% accuracy. Using as input the analog signals from, to cite but one example, the ground-station equipment of a telemetering system, the system converts data to binary-coded decimal form suitable for recording on magnetic tape or into computer memory systems. It can be employed to digitize either a single phenomenon sampled at a high rate or many phenomena sampled sequentially.

COMPUTER Systems

Computational speed is unusually high in various possible systems assembled around the Model 30-201 Automatic Digital Computer. Operating on a binary-coded-decimal number system, the computer's magnetic-drum main memory can store 4000 words, plus 80 additional words in the "quick-access" memory. Number length is 10 decimal digits plus a sign designation. A single-address code is employed, with a total of 42 basic commands.

High computational speed is achieved by: first, a flexible command system; second, a "B-Register" for rapid temporary modification of commands; and third, the 80-word quick-access memory. Most operations are executed at rates of 500 per second.

The Model 30-201 Computer is the central unit about which many computer systems can be designed. A wide variety of auxiliary input and output equipment, plus facilities for additional word storage, can be combined in systems adaptable to many scientific, engineering, and statistical applications.

CONSOLIDATED ENGINEERING CORPORATION
300 North Sierra Madre Villa
Pasadena 15, California

GAP/R

George A. Philbrick Researches, Inc.

230 Congress Street, Boston 10, Massachusetts

September, 1952

O P E N   L E T T E R

For Immediate Release

Attention: Each Reader of the Roster of Organizations in the Field of Automatic Computing Machinery.

Reference: Availability of Computing Machinery.

Dear Reader:

To show you in condensed fashion what we make and why, the two pages following are given over to selected excerpts from our current literature.

This company specialises in an exclusive type of automatic computor, classed as ANALOG, HIGH-SPEED, and ALL-ELECTRONIC. All our efforts since 1946 have been concentrated on this product; on its design, production, and application to the study and solution of a variety of problems. This equipment is being successfully employed to aid research and development in fields such as industrial controls, servomechanisms, propulsion regulation, hydro governing, vibrations, biochemistry, etc. It is well suited to the representation and study of nonlinear dynamics and other physical phenomena.

A complete series of standard computor components is offered, enabling direct assemblage of computing structures for the problems at hand. The components are available individually or in appropriate working assortments, and the modular arrangement is considered to contribute to their flexibility and general usefulness.

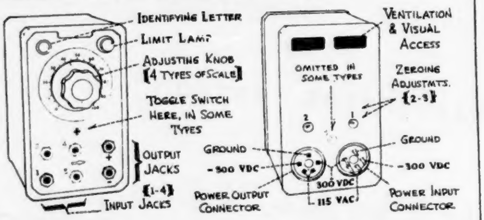
You are welcome to write for the general GAP/R Catalog & Manual, which describes our regular line of equipment and the techniques of its operation. Other documents include the first issue of "The Lightning Empiricist", devoted to lore on this brand of computing, as well as certain reprints, etc. Prices and quotations will be promptly supplied, and your questions on any score are invited.

Sincerely yours,

GEORGE A. PHILBRICK RESEARCHES, INC.

The K3 Series of Analog Computor Components

Each K3 Component is a self-contained operational unit, engineered for functional efficiency in a computing system. A special cast aluminum case houses each Component uniformly, compactly, and durably. At the back, 5-pin input and output connectors supply power, and permit cable connections in cascade from each Component to the next. On the front, one to four input jacks and two output jacks provide for computing signal connections via standard cables. The output jacks afford direct and inverted signals, and are usable simultaneously. An indicating dial on each Component serves for setting characteristics; and a lamp denotes limiting of the output signals.



GENERAL SPECIFICATIONS

Inputs (1-4)
Range: 50 VDC plus and minus
Impedance: Over 1 megohm
Jacks: Grounding without plug

Outputs (2)
Range: 50 VDC plus and minus
Impedance: Under 300 ohms
Jacks: Non-grounding

Power Requirements:
10-12 Milliamperes at 300 VDC
10-12 Milliamperes at −300 VDC
0.1-0.13 Amperes at 115 VAC

Amplifiers
Direct Current, with various gains
Rise-time: 2 microseconds, (unit gain)
Utility Ampl. (alpha): 2 triodes
Special Ampl. (beta): 4 triodes

Tube Complement (4-5)
4-5 12AX7
0-1 12AU7
1 NE-51 Limit Lamp

Performance
Checked by known responses, using standard signals and CRO.

Accuracy:
As indicated on page 3

Drift in DC Levels
0.5% per day, following warmup, on regulated AC.

Zeroing
Bimonthly, or when and if necessary, using slotted adjustments (2-3) at rear.

Case Dimensions
$5\frac{1}{4}$ by $7\frac{1}{4}$ by $4\frac{3}{4}$ inches.
Four such cases will fit abreast between the channels of a standard rack. (Use Component Shelf Model HC).

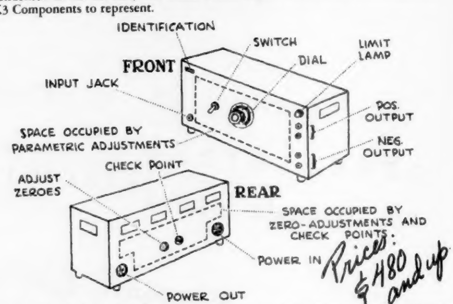
Finish:
Durable Black Wrinkle.

Weight:
5 pounds.

Prices: $200 to $250

The K4 Series of Analog Computor Components

These Components embody operations and functions which cannot be condensed to the K3 size, and which would require more than 4 interconnected K3 Components to represent.



Prices: $480 and up

Most of the descriptive remarks on page 4 apply to these Components also, though with the following exceptions. First the *width* is 4 times as great, very nearly; one unit fits on an HC Shelf rather than 4. Also there may be as many as 4 times the number of tubes, with correspondingly higher power consumption. Naturally, more parametric adjustments are possible. Since there is more room, the positive and negative output jacks are each supplied in paralleled pairs for multiple connections.

The width of 17 inches permits attachment of 1-inch angles at the front on each side, so that any K4 Component may be installed in place of a standard 7 by 19 inch rack panel.

GENERAL SPECIFICATIONS

Inputs
(2-4)
Range: —50 to 50 VDC
or —25 to 25 VDC
Impedance: Above 1 Megohm

Outputs
(2-5)
Range: —50 to 50 VDC
Impedance: Below 300 Ohms

Power Requirements
20-60 Milliamperes at 300 VDC
20-50 Milliamperes at —300 VDC
0.13-0.38 Amperes at 115 VAC

Accuracy
See remarks on page 3.

Tube Complement
8-22 12AX7, 0-4 12AU7

Limit Lamp
NE-51

Input Jacks
Grounding on plug removal.

Output Jacks
Duplicate: non-grounding.

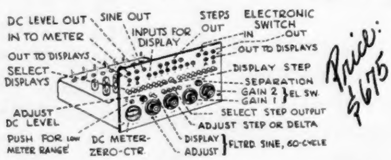
Case Dimensions
17 by 7 by $5\frac{1}{4}$ inches.

Finish: Durable Black.

Weight: 20 pounds.

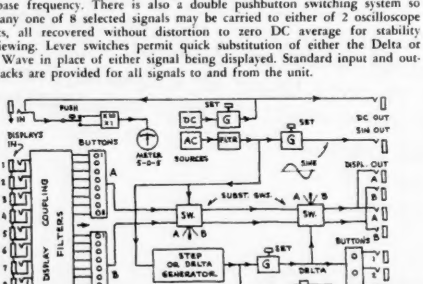
Central Component, Model CC

The Central Component combines several facilities and conveniences for successful operation of the Computor Components. Together with the Power Supply and one or more CRO's, it makes up a complete Computing System for whatever Computor Components are to be employed. This device supplies a calibrated and adjustable initiating signal (or *stimulus*) of special type, called the DELTA Wave, which is fed via push-buttons to four outputs. It has a DC metering system of dual sensitivity, which may be used for precise voltage measurement and for the provision of steady voltages for test or computation. It also has an accurate 30-cycle electronic switch, which preserves



Price: $675

DC and provides for synchronized display of any two variables. There is a smooth adjustable 60-cycle sine signal for "exploration" and for testing at the base frequency. There is also a double pushbutton switching system so that any one of 8 selected signals may be carried to either of 2 oscilloscope inputs, all recovered without distortion to zero DC average for stability of viewing. Lever switches permit quick substitution of either the Delta or Sine Wave in place of either signal being displayed. Standard input and output jacks are provided for all signals to and from the unit.



Basic Computor Assembly (CA)

One of the virtues of the GAP/R Component series is that a Computor may be acquired in easy stages. A modest first selection may be expanded to any desired extent with increasing complexity of problems to be solved, and as the user's familiarity grows.

A suggested assortment has been worked out which, while economical, provides ample capacity for a variety of problems. For example, differential equations of 4th order and lower may be solved. This assortment includes one Central Unit — the Relay-rack Assembly —, plus the following 12 Computor Components: 3 K3-A Adding Components, 5 K3-C Coefficient Components, 3 K3-J Integrating Components, and 1 K3-L Unit-lag Component. An appropriate selection of power and signal cables, with fittings, is also included.

Power Requirement: 115 V, 60 Cycles

Shipping Weight Cased: 390 pounds

SERVICES by GAP/R

It is of the highest interest to this organization to promote the successful application of its products, and of computing machinery in general, to problems in which they can serve progress most effectively. Thus a primary service is to advise on how a problem is best attacked: on what method or methods of those available should be chosen. If it appears that our method is best, (and the enquirer will apply a discount for local bias), then a subsequent service is to show how the problem is approached in terms of our equipment.

This generally involves assistance with equations (advanced ability in mathematics is maintained), reduction of these to block-diagram form, in many cases setting up and operating an appropriate Computing Assembly in our laboratory, and the solution of examples. No charge is made for this service, whether or not a sale of equipment results.

Frequently our engineers, in dealing confidentially with customer's problems, have been able to make very real contributions to developments in progress. As is desirable in this activity, a broad range of research experience is represented. Noteworthy is an established reputation in the field of automatic controls, mechanical, electrical, and fluid-operated, covering most of their diverse applications. And of course GAP/R has a strong position in electronics itself, in research techniques and facilities.

For handling overhaul and repair with economy and dispatch, GAP/R is amply equipped. On the rare occasions when necessary, Components are repaired or replaced within an average interval of one week.

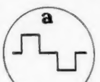
Every Component is guaranteed for 90 days against failure due to faulty parts or manufacture. After this period a nominal service charge may be made if equipment is returned to the laboratory for replacement or overhaul.

Oscilloscope Presentation Techniques

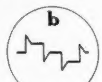
For the display of computed results in the high-speed type of analog, a cathode-ray oscilloscope (CRO) is essential. The most expensive instruments are not necessary, however; some very successful work has been done using the most modest possible CRO. Currently, the most popular choice happens to be the DuMont 304-H.

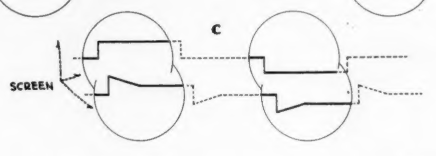
There is no need to discuss here the standard operating techniques which are well described in CRO instruction books, and which in fact are widely familiar among laboratory personnel. On the other hand, a few comments will be helpful on the operations required for applying the CRO as a displaying means for a high-speed Computor.

Generally a 60-cycle sweep, synchronized to the line frequency, is most useful for plotting. If the Delta Wave be plotted thus, and the gains adjusted to keep the whole trace visible, one obtains the pattern shown at (a).



A possible *response* pattern, with the same CRO settings, is shown at (b). By increasing the horizontal gain, and shifting the horizontal position, one obtains the highly useful types of display shown at (c).





The calibration of CRO screens, say in volts per inch, is generally not adequately attained through the gain adjustments alone, for any but rough solutions. Thus it is recommended that a step of known size be fitted to a known vertical distance on the screen. With the same CRO gain adjustment, the excursions of any response switched on in place of the step may be determined by simple comparison. On the time axis, the horizontal (sweep) gain may be adjusted so that the 4-millisecond individual computing interval is fitted to a convenient known dimension on the screen. Then, provided the sweep is reasonably linear, a measure of fractional time during the response or solution is available. More accurate timing may be had by applying a periodic signal, say of 25 KC, either to the vertical input or as intensity-modulation. This will divide the computing interval into 100 equal parts.

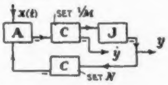
A very interesting technique, not as familiar as plotting against time by employing a sweep signal, is to plot one signal against another. This was referred to above in connection with cross-plotting to show geometrical characteristics. By plotting two computed signals against one another, *orbits* of operation are obtained in which time becomes only a parameter along the curves. In dynamics for example, the coordinates of displacement and velocity are called *phase-space*, and plots in this space — easily obtained in the high-speed analog without extra equipment — are useful typically in nonlinear work. In controls, specifically governors, plots of regulated versus manipulated variables are valuable in several ways; they are called Léauté Diagrams. More generally, the phase relations between variables are clearly seen in such plotting, as also are stability and the effects of discontinuities. Wherever this type of cross-plotting leads to confusion, one may quickly return to time-plots for each variable to keep the record straight. The technique has found favor in certain cases, however, since it provides information in such compact form.

Some Block Diagrams

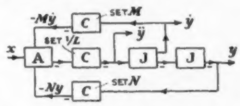
Block Diagrams, so-called, have become the accepted shorthand for dynamic systems, particularly as regards computors. They are equivalent to equations, with additional causal information, and provide a stepping-stone close to an analog computing structure and its Components. In setting up the Computor, if added realism is sought, the Components may be assembled and interconnected in a manner which resembles the block diagram.

One of the commonest physical situations is that covered by the equation:

$$M\frac{dy}{dt} + Ny = x(t)$$



This is directly set up with 4 Components as shown. Outputs of y and its derivative, among others, are available. (Note that negative Component outputs are employed wherever possible.) An equivalent assembly not giving the derivative is simply a K3-L Unit-lag Component in series with a K3-C Coefficient Component. The K3-L is set at M/N in appropriate units, and the K3-C is set at $1/N$. (Hereafter we may refer to a Component by its final initial alone.)

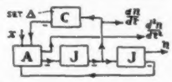


Going one notch beyond the above 1st-order system, we show a 2nd-order system. Its equation is:

$$L\frac{d^2y}{dt^2} + M\frac{dy}{dt} + Ny = x(t)$$

It is often desirable to be able, as here, to set each parameter separately. However, simplifications are possible when liberties may be taken with the variables. Thus if $Ny = \eta$, $t(N/L)^{1/2} = \tau$, and $M/(LN)^{1/2} = \Delta$, the equation becomes:

$$\frac{d^2\eta}{d\tau^2} + \Delta\frac{d\eta}{d\tau} + \eta = x\left(\sqrt{\tfrac{L}{N}}\,\tau\right)$$



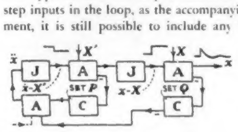
and results in the simpler block diagram shown.

In setting up block diagrams for equations as above, and hence also for Computors, one may almost always proceed as follows: Assume the highest derivative (order n) is available as a signal, and integrate it n times. This gives all the lower derivatives including the zeroeth. With these signals in combination, one supplies the assumed n-th derivative as expressed by the differential equation "solved" explicitly for that quantity. This method generalises satisfactorily for sets of equations. Sometimes other tricks are necessary, but the technique is quite universal. It is standard Differential Analyzer practice, for example.

INITIAL CONDITIONS In physical systems there is usually an input variable which, as *stimulus*, determines initial conditions. The cases above are simple examples, with non-homogeneous equations. There was no question of how one embodies the initial values of the dependent variable(s) and the derivatives thereof. Formal mathematical equations are frequently presented, however, in homogeneous form, with specific values for all but the highest derivative. For instance consider (the dot-notation for derivatives is used):

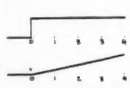
$$\ddot{x} + P\dot{x} + Qx = 0, \quad \text{and} \quad x(0) = X, \quad \dot{x}(0) = X'$$

This type of situation may be handled straightforwardly by the addition of step inputs in the loop, as the accompanying diagram shows. With this arrangement, it is still possible to include any "forcing function" to cover the non-homogeneous case by adding it in as usual ahead of the highest derivative. If this input were zero prior to the initial instant (and of course never infinite) it will not influence the initial conditions cited above.



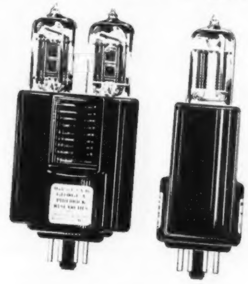
Operators and Responses

$\varphi(p)$	$\psi(t)$
1	1
$\frac{1}{Tp}$	$\frac{t}{T}$
$\frac{1}{1+Tp}$	$1-e^{-t/T}$
$\frac{Tp}{1+Tp}$	$e^{-t/T}$
$\frac{1+Tp}{Tp}$	$1+\frac{t}{T}$
$\frac{1}{(Tp)^2}$	$\left(\frac{t}{T}\right)^2$
$\frac{1}{(1+Tp)^2}$	$1+\left(\frac{t}{T}-1\right)e^{-t/T}$
$\frac{1}{(1+Tp)(1+\alpha Tp)}$ $\alpha \neq 1$	$1-\frac{1}{1-\alpha}\left[e^{-t/(\alpha T)}-\alpha e^{-t/T}\right]$
$\frac{1}{1+(Tp)^2}$	$1-\cos\frac{t}{T}$
$\frac{1}{(1+\beta Tp)^2+(Tp)^2}$ $\lambda^2=1+\beta^2$	$1-\lambda e^{-\frac{\beta t}{\lambda^2 T}}\cos\left[\frac{t}{\lambda^2 T}+\tan^{-1}\beta\right]$



Operational Amplifier

GAP/R MODEL K2-W



SPECIFICATIONS

USAGES: Feedback Computors, dynamic synthesizers, simulators, buffer amplifiers, followers, etc., etc.

VOLTAGE GAIN: 10,000 plus.

INPUTS: Differential pair. Resistance of each is 10 megohms plus.

OUTPUTS: Impedance is 300 ohms, up to 1 milliampere and to 50 volts plus or minus.

RESPONSE: Repetitive or discrete. Aperiodic from DC up to 2 microseconds rise time under full feedback.

POWER: Total consumption 6½ watts.

TUBES: 2 12AX7. **PLUG:** Octal.

SEATED HEIGHT: 4 ins. **WEIGHT:** 2.8 oz.

UNIT PRICE: $42.40 Complete, Postpaid in USA.

Here is the latest addition to our line


DEVELOPMENT
SELLING
MANUFACTURING
RESEARCH
REMINGTON RAND Inc.
ECKERT MAUCHLY DIVISION
also
Engineering Research Associates
(subsidiary)
OUTPUT
INPUT
PROCESSING
STORAGE
BALANCED PERFORMANCE

For more than forty years Remington Rand has been a source of numerous significant machine developments for business. Univac Fac-Tronic System – latest in a long line – is the first universal electronic system for processing both numeric and alphabetic data without special coding.

PROVEN LEADERSHIP

The system is flexible enough to fit any record-keeping application from comprehensive statistical problems of the U.S. Census Bureau to complex mathematical problems and huge records-analysis problems of industrial organizations. The forerunners of Univac—electronic computers Eniac and Binac—provided a testing ground for the techniques and equipment adapted for use in Univac. With production lines in operation, Univac orders are being solicited and deliveries made.

Four hundred five-item shipments priced, extended, totalled and prepared for printing (including name and address) in thirty-five minutes. Performance

PROVEN PERFORMANCE

standards were exceeded when the computer—after the programming unit had been checked out—ran for 29 hours of continuous computation without interruption of any kind. At another time, covering 20 successive test units, 780 million pulses were read without interruption.

MATRIX ALGEBRA

ORDER	MULTIPLICATION		INVERSION
	SQ. X SQ.	SQ. X COL.	
50	1 hr.	1 min.	1 hr.
100	7 hrs.	7.5 mins.	8 hrs.
200	55 hrs.	30 mins.	57 hrs.
300	185 hrs.	1 hr.	200 hrs.

The First Name in Business Electronics **Remington Rand** INC